reference	participants' characteristics	intervention group/ control group	outcomes	critical appraisal/ conclusion
Esme et al. 2012 Comparison between intermittent IV analgesia and intermittent paravertebral subpleural analgesia for pain relief after thoracotomy Eur J Cardiothorac Surg. 2012;41(1):10-3.	**inclusion criteria** - not reported **exclusion criteria** - history of severe heart disease or hepatic or renal failure - ASA physical status ≥IV - patients who underwent resection of the pleura or chest wall - hemorrhagic diathesis - receiving anticoagulant therapy or acetylsalicylic acid - a known allergy to local anaesthetic agents **demographic data**: Variable group C group B group M p sex (m/f) 9/6 8/7 10/5 0.77 age (yrs) 51.86±11.5 49.13±13.37 54.4±12.64 0.52 preop FEV_1 (% predicted) 65.6±9.55 64.33±9.98 64.33±8.94 0.91 number of tube thoracostomy 1.66±0.48 1.73±0.45 1.6±0.5 0.75 **patient flow and follow up:** total patient number included: 45 randomised in: group C: 15 group B: 15 group M: 15 excluded: 0 analysed: 45 follow-up: 1, 6, 12, 24, 48, and 72 h	**intervention prior to anaesthesia** - not reported **mode of anaesthesia** - not reported **surgical approach** - posterolateral thoracotomy number of tube thoracostomy 1.66±0.48 1.73±0.45 1.6±0.5 p=0.75 duration of the surgical procedure 156±28.23 154±27.46 152±26.51 0.92 **supplemental analgesia** - IV paracetamol 1 g **at the end of surgery & postoperative analgesia** - group C (control): IV tramadol 100 mg IV metamizol 1g every 4 h for 3 days. - group B (bupivacaine): PVB with1.5 mg/kg bupivacaine/4 h - group M (morphine): PBV with 0.2 mg/kg morphine sulphate/4 h	**postoperative pain [VAS]: mean±SD** Time (h) group C group B group M 1 5.53±0.99 5.26±1.53 5.13±0.83 6 4.6±0.91 3.93±1 .33 2.66±0.72 12 3.8±1.01 2.8±1.32 2.00±0.84 24 2.53±1.18 2.93±0.7 1.73±1.03 48 1.53±0.99 0.86±1.24 0.40±0.5 72 1.33±1.04 0.73±0.93 0.40±0.5 - VAS scores were lower in group M and group B compared with group C at all postop time points - the mean postoperative pain score was significantly different between group C and group B at postoperative hour 12 ($p<0.05$) - there were significant differences between VAS scores in group C and group M at 6, 12, 48, and 72 h postop ($p<0.05$) - there was a significant difference between groups B and M groups in terms of pain score at 6 and 24 h postop ($p<0.05$) **additional analgesic requirement over 72 h: n(%)** group C group B group M 7 (46%) 4 (26%) 4 (26%) **total dosage of supplemental paracetamol in 72 h: mg** group C group B group M 900 333 200 - the difference between group C and group M was significant ($p<0.05$), but not between group C and group B ($p=0.10$) or between group B and group M ($p=0.87$) **adverse effects/ events:** - nausea was seen in 3 patients in group C	**methodological shortcomings** - primary and secondary outcome measures not defined - not reported how sample size was determined or any explanation of any interim analyses and/or stopping rules - method used to implement the random allocation sequence not reported - not reported how the sequence was concealed until interventions were assigned - not reported who generated the allocation sequence, who enrolled participants, and who assigned the participants to their groups - participant flow through each stage was not reported - protocol deviations from study as planned not described - dates defining the period of recruitment and follow-up not reported **level of evidence: 1** **authors' conclusion** "patients undergoing lung resection via thoracotomy showed reduced postoperative pain and better surgical outcomes with respect to length of hospital stay, postoperative FEV_1, pulmonary complications, and need for bronchoscopic management, when paravertebral subpleural analgesia was induced by morphine."
Ammar et al. 2014 Does the addition of magnesium to bupivacaine improve postoperative analgesia of ultrasound-guided thoracic paravertebral block in patients undergoing thoracic surgery? J Anesth. 2014;28(1):58–63.	**inclusion criteria** - not reported **exclusion criteria** - cardiac problems - significant obstructive or restrictive lung diseases - pulmonary hypertension - pre-existing coagulation disorders - refusal to give informed consent - morbid obesity (BMI >30) - spinal deformity - local infection at the site of the block **demographic data**: group B group M p age (yrs) 48.4±11.0 49.4±12.2 0.76 sex (m/f) 17/8 16/9 0.54 weight (kg) 75±8.4 76±7.9 0.88 height (cm) 170±13 171±12 0.83 operative time (min) 134±44 136±47 0.79 **patient flow and follow up:** total patient number included: 50 randomised in: group B: 25 group M: 25	**intervention prior to anaesthesia** - group B (bupivacaine): PVB with 12 mL of 0.5 % bupivacaine plus 3 mL of 0.9 % saline - group M (magnesium): PVB with 12 mL of 0.5 % bupivacaine + 150 mg magnesium sulphate (in 3 mL of 0.9 % saline) **mode of anaesthesia** - fentanyl **surgical approach** - elective open thoracic surgery **supplemental analgesia** - if VAS>3: bolus IV morphine, 0.1 mg/kg, lo 15 min **postoperative analgesia** - thoracic PVB - 1 g IV acetaminophen every 6 h during first 24 h after surgery - 1 g acetaminophen, orally every 6 h for 4 days	**postoperative pain [VAS]: mean (95% CI)** - results showed statistically significant less pain in group M at 1, 2, 3, 12, 24 and 36 h postop, both at rest and on coughing ($p<0.05$) **total dosage of morphine in 48 h [mg]: mean± D** group B group M p 29.5±11.1 16.2±7.4 0.01* **pulmonary function** - postoperative pulmonary function tests (PEFR, FEV_1 and FVC) were significantly better in group M ($p<0.05$) **adverse effects/ events: n (%)** group B group M p nausea and vomiting 5(20%) 3(12%) 0.35 pruritus 2(8%) 1(4%) 0.50 dizziness 4(16%) 0(0%) 0.05 somnolence 5(20%) 0(0%) 0.03*	**methodological shortcomings** - participant flow through each stage was not reported**level of evidence: 1** **authors' conclusion** "the findings of the present study supports the effective use of magnesium as an adjunct to local anaesthetics for thoracic PVB to improve and prolong the analgesia and spare need for IV opioids"

reference	participants' characteristics	intervention group/ control group	outcomes	critical appraisal/ conclusion
	excluded: 0 analysed: 50 follow-up: 1, 2, 3, 12, 24, 36, 48 h postop			
Gulbahar et al. 2010 A comparison of epidural and paravertebral catheterisation techniques in post-thoracotomy pain management. Eur J Cardiothorac Surg. 2010;37(2):467-72.	**inclusion criteria** - not reported **exclusion criteria** - patients' unwillingness to participate - thoracic vertebrae diseases - procedures such as pleurectomy and pleuropneumonectomy - empyema - systemic sepsis - allergy to diclofenac sodium and amide-type local anaesthetics - contraindication for NSAIDs - psychiatric diseases - inability to feedback pain scoring - inability to use manual spirometry or PCA apparatus - the need for additional incisions such as laparotomy - diabetes mellitus - concomitant endocrine diseases such as coagulopathy **demographic data**: group T group P p age (yr) 46.32±16.28 (16–73) 49.72±15.96 (13–71) 0.462 sex (m/f) 17/2 19/6 0.433 **patient flow and follow up:** total patient number included: 50 randomised in: group T: 19 group P: 25 excluded: group T: 6 analysed: 44 follow-up: 0,1, 2, 3, 4 days postop	**intervention prior to anaesthesia** - not reported **mode of anaesthesia** - fentanyl **surgical approach** group T group P pneumonectomy 3 0 bilobectomy 1 3 lobectomy 5 6 wedge resection 3 8 open biopsy 2 4 cystotomy and capitonnage 2 3 miscellaneous 3 1 **at the end of surgery** - group T (TEA): 0.25% bupivacaine (5 mL) via epidural at T7–T10 at a rate of 0.10 mL/kg/h (1 h lo and 2 mL bolus) - group P (PVB): infusion via thoracic catheter of 0.25% bupivacaine at a rate of 0.10 mL/kg/h (1 h lo and 2 mL bolus) **supplemental analgesia** - not reported **postoperative analgesia** - not reported	**postoperative pain and additional analgesic requirements** - no significant differences between group T and group P in mean VAS score on days 1 (p=0.943), 2 (p=0.896) and 3 (0.686) postop - no significant differences between number of presses needed on the PCA for morphine between groups **adverse effects/ events: n** group T group P p side effects 14 0 0.011 urinary retention 4 0 nausea 5 0 vomiting 3 0 hypotension 2 0	**methodological shortcomings** - not reported how sample size was determined or any explanation of any interim analyses and/or stopping rules - method used to implement the random allocation sequence not reported - not reported how the sequence was concealed until interventions were assigned - not reported who generated the allocation sequence, who enrolled participants, and who assigned the participants to their groups - participant flow through each stage was not reported - protocol deviations from study as planned not described - dates defining the period of recruitment and follow-up not reported **level of evidence:** 1 **authors' conclusion** "Continuous PVB and epidural blockade methods, being one of the components of the analgesia strategy, are quite effective techniques in managing the post-thoracotomy pain. There is no statistically significant difference in the two methods in terms of efficient analgesia."
Messina et al. 2009 A comparison of epidural vs. paravertebral blockade in thoracic surgery. Minerva Anestesiol. 2009;75(11):616-21.	**inclusion criteria** - not reported **exclusion criteria** - ASA physical status IV - patients with a significant bleeding history - severe spine or chest wall deformity - pre-existing motor or sensory deficit - hypersensitivity to ketorolac, morphine or bupivacaine **demographic data**: **mean±SD** group P group E age (yrs) 62±14.2 65±6.3 weight (kg) 70±11.6 65±17.3 female gender, n (%) 5 (41.7%) 7 (58.3%) ASA II. n (%)	**intervention prior to anaesthesia** - not reported **mode of anaesthesia** - fentanyl **surgical approach** - lobectomy by thoracotomy **at the end of surgery** - group P (PVB): perfusion of 0.25% levobupivacaine and fentanyl 1.6 g/mL at 0.1 mL/kg/h - group E (epidural): 0.125% levobupivacaine and fentanyl 2 g/mL at 0.08 mL/kg/h **supplemental analgesia** - not reported **postoperative analgesia** - not reported	**postoperative pain [VAS]: mean±SD** group P group E p h postop recovery room 4±3.5 3±3.5 0.5 6 3±2.7 2±2.5 0.3 24 1±1.4 1±2.1 0.3 48 2±3.2 2±2.0 0.9 72 1±1.9 2±1.9 0.1 **time to first analgesic request [h]: mean±SD** - not reported **total dosage of morphine 48 h [mg]: media (25-75th percentiles)** group P group E p	**methodological shortcomings** - compared different doses of local anaesthetic between the epidural and the paravertebral group - the settings and locations where the data were collected not reported - not reported who generated the allocation sequence, who enrolled participants, and who assigned the participants to their groups - not reported whether the sequence was adequately concealed until interventions were assigned - participant flow through each stage was not reported - for each primary and secondary outcome, a summary of results was not reported for each

reference	participants' characteristics	intervention group/ control group	outcomes	critical appraisal/ conclusion
	7 (58.3%) 8 (66.6%) ASA III. n (%) 5 (41.7%) 4 (33.3%) **patient flow and follow up:** total patient number included: 24 randomised in: group P: 12 group E: 12 excluded: 0 analysed: 24 follow-up: 6, 24, 48, and 72 h		36 (22–42) 9 (2–22) 0.003 - morphine consumption was increased in group P each time point **adverse effects/ events:** - spirometer measurements three days after surgery indicated the better performance of the patients in the epidural group. - FEV_1 returned to 83% of the preoperative value in the epidural group, while only reaching 31% in the paravertebral group (p=0.001)	group with the estimated effect size and its precision (eg 95% CI) - primary and secondary outcome measures not defined - not reported how the sequence was concealed until interventions were assigned - protocol deviations from study as planned not described - dates defining the period of recruitment and follow-up not reported - important adverse events or side effects not reported **level of evidence: 2 (?)** **authors' conclusion** "postoperative epidural analgesia is better than paravertebral in patients scheduled for thoracic surgery and for this reason it should remain the "gold standard" technique of pain management for major thoracic surgery"
Fibla et al. 2008 Comparative analysis of analgesic quality in the postoperative of thoracotomy: paravertebral block with bupivacaine 0.5% vs ropivacaine 0.2%. Eur J Cardiothorac Surg. 2008;33(3):430-4.	**inclusion criteria** - patients scheduled for an anterior (AT) or posterolateral (PT) thoracotomy for pulmonary resection during 2006 **exclusion criteria** - not reported **demographic data**: **mean±SD** group B group R age (yrs) 61.2±9.8 60.0±9.5 weight (kg) 75.3±13.7 72.0±9.7 height (cm) 165±8.0 167±9.0 sex (m/f) 26/9 22/13 ASA score I/II 27 28 ASA score III 8 7 smoking (packs/years) 50±30 40±25 **patient flow and follow up:** total patient number included: 76 randomised in: *For analgesic technique* Group B: 35 Group R:35 *For type of surgery* Group AT: 38 Group PT: 32	**intervention prior to anaesthesia** - not reported **mode of anaesthesia** - fentanyl **surgical approach (n)** anterior thoracotomy lobectomy 12 14 wedge resection/others 7 5 posterolateral thoracotomy pneumonectomy 3 3 lobectomy 12 10 wedge resection/others 1 3 duration of surgery (min) 133±56 136±50 **at the end of surgery** - group B (bupivacaine): initial bolus of 15 mL bupivacaine 0.5% - group R (ropivacaine): initial bolus of 20 mL ropivacaine 0.2% **supplemental analgesia** - meperidine, rescue drug (bolus of 50 mg SC) **postoperative analgesia** - group B: Patients received a bolus of 10 mL bupivacaine every 6 h + 2 g IV methamizol every 6 h - group R: as group R, except a bolus of 15 mL ropivacaine every 6 h	**postoperative pain [VAS]: mean±SD** type of anaesthetic h postop group B group R p 1 3.1±1.5 3.8±1.4a 0.020[b] 6 6.9±1.2a 7.1±1.1a 0.493 24 6.2±1.3 6.6±0.9 0.035[b] 48 4.8±1.9 5.2±1.9a 0.354 72 3.4±1.8 4.0±1.6 0.274 Mean 4.9±2.1a 5.4±1.9a 0.029[b] type of surgery h postop group AT group PT p 1 2.9±1.4 4.3±1.3 0.000b 6 6.7±1.1 7.5±1.0 0.019b 24 6.0±1.1 6.8±1.1 0.001b 48 4.0±2.1 6.0±1.1 0.000b 72 3.0±1.6 4.7±1.4 0.000 b Mean 4.5±2.1 5.9±1.7 0.000 b [b]Statistical significance (p<0.05) **supplemental analgesia** intraoperative IV fentanyl (mg) 580±60 540±57 **requirement for meperidine (rescue analgesia) (n)** group B group R p 5 6 >0.05 **adverse effects/ events: n (%)** - none reported	**methodological shortcomings** - eligibility criteria for participants and the settings and locations where data was collected were not reported - primary and secondary outcome measures not defined - not reported how sample size was determined or any explanation of any interim analyses and/or stopping rules - method used to implement the random allocation sequence not reported - not reported how the sequence was concealed until interventions were assigned - not reported who generated the allocation sequence, who enrolled participants, and who assigned the participants to their groups - participant flow through each stage was not reported - method used to generate the random allocation sequence not reported **level of evidence: 1** **authors' conclusion** "Patients received satisfactory analgesia, as assessed by pain scores. Bupivacaine resulted in better VAS scores (p<0.05) overall and after the first hour and 24 h, however the two groups had no difference in the requirement for rescue analgesia. AT was a less painful incision in comparison to PT, with statistically significant values both with bupivacaine and ropivacaine (p<0.01)."

reference	participants' characteristics	intervention group/ control group	outcomes	critical appraisal/ conclusion
	excluded: 6 analysed: 70 follow-up: 1st, 6, 24, 48, 72 h			
Fibla et al. 2011 The efficacy of paravertebral block using a catheter technique for postoperative analgesia in thoracoscopic surgery: a randomized trial. Eur J Cardiothorac Surg. 2011;40(4):907-11.	**inclusion criteria** - patients scheduled for VATS for spontaneous primary pneumothorax or solitary pulmonary nodule (SPN) **exclusion criteria** - none reported **demographic data**: group P group N age (yr) 40±19 41±19 weight (kg) 69±10 67±11 height (cm) 172±8 173±7 sex (m/f) 12/8 11/9 **patient flow and follow up:** total patient number included: 44 randomised in: group P: 20 group N: 20 excluded: 4 analysed: 40 follow-up: 1, 6, 24, and 48 h	**intervention prior to anaesthesia** - not reported **mode of anaesthesia** - fentanyl **surgical approach** group P group N pneumothorax/lung nodule 13/7 12/8 **at the end of surgery** - group P (PVB): received a bolus of 15 mL ropivacaine 0.2% every 6 h + IV metamizol - group N (alternate NSAIDs): had infiltration of the surgical wounds with bupivacaine 0.5% (5 mL for each wound) at the end of surgery and + postop IV paracetamol (1 g) + IV metamizole (1 g) every 6 h **rescue analgesia** - meperidine bolus of 50 mg SC **postoperative analgesia** - group P: bolus of 15 mL ropivacaine 0.2% every 6 h, + 1 g IV metamizol every 6 h - group N: IV paracetamol (1 g) + IV metamizole (1 g) every 6 h	**postoperative pain [VAS]: mean±SD** hr group P group N p 1 1.4±0.8 2.8±1.0 <0.001 6 3.4±1.2 4.9±1.3 0.001 24 2.6±1.0 3.9±1.4 0.002 48 2.2±0.9 3.3±1.0 0.006 mean 2.4±1.3 3.8±1.4 <0.001 **intraoperative IV fentanyl [mg]: mean±SD** group P group N 232±25 227±16 **adverse effects/events:** - none reported	**methodological shortcomings** - eligibility criteria for participants and the settings and locations where data was collected were not reported - primary and secondary outcome measures not clearly defined - method used to implement the random allocation sequence not reported - not reported how the sequence was concealed until interventions were assigned - not reported who generated the allocation sequence, who enrolled participants, and who assigned the participants to their groups - participant flow through each stage was not reported **level of evidence: 1** **authors' conclusion** "PVB through a PVC inserted under direct vision during VATS surgery is a safe and effective procedure to improve pain treatment after thoracoscopic surgery"